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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,950	09/22/2003	James T. Yeh	S-99117	5724

31970 7590 10/18/2006

UNITED STATES DEPARTMENT OF ENERGY  
1000 INDEPENDENCE AVENUE, S.W.  
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WASHINGTON, DC 20585-0162

EXAMINER

NGUYEN, NGOC YEN M

ART UNIT PAPER NUMBER

1754

DATE MAILED: 10/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/664,950

**Applicant(s)**

YEH ET AL.

**Examiner**

Ngoc-Yen M. Nguyen

**Art Unit**

1754

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2006.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 20 is/are pending in the application.  
4a) Of the above claim(s) 10-17 is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-9, 20 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 4, 2006 has been entered.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9, 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mimura et al (5,648,053) in view of Izutsu '084 and Gal (5,624,649) and optionally further in view of Slavid et al (2002/0058164).

Mimura '053 discloses a process for removing carbon dioxide and nitrogen oxides from combustion gases (note title).

As shown in Figure 1, the process treating a combustion gas comprises the steps of cooling and dedusting the combustion gas from a boiler (note column 2, lines 22-25);

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adding ozone to oxidize the NO to NO<sub>2</sub> (note column 2, lines 32-35), desulfurizing the resulting gas and then removing CO<sub>2</sub> along with any NO<sub>2</sub> (note column 3, lines 19-24).

The combustion gas in Mimura '053 is a gas coming out of boilers of thermal power plants that burn much fossil fuels (note column 1, lines 26-29).

The difference are Mimura '053 does not disclose (1) the detail for the desulfurizing step and (2) the simultaneous removal of other acid gases such as HCl or HF.

For difference (1), Izutsu '084 discloses a process for producing a fertilizer from gas containing sulfur dioxides, comprising:

- injecting ammonia into said gas;
- irradiating said gas with an electron beam; and
- collecting a product (note claim 1).

Izutsu '084 discloses that the flue gas can be for example fossil fuel combustion flue gas (note column 1, lines 48-55).

SO<sub>2</sub> which is a primary component of sulfur oxides contained in fossil fuel combustion flue gas or the like, is oxidized very quickly into SO<sub>3</sub> by active components including O radicals, OH radicals and the like generated from oxygen molecules or water molecules in the gas when irradiated with the electron beam. This SO<sub>3</sub> reacts with ammonia to produce sulfamic acid or with water to produce sulfuric acid (note column 1, line 62 to column 2, line 14).

Izutsu '084 further discloses that flue gas also contains nitrogen oxides and the flue gas is cooled to 150°C by a heat exchanger, then cooled to 60°C by a water spray

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cooling tower (note column 8, lines 47-67). The water spray cooling tower would inherently remove any particulate matter from the flue gases.

Izutsu '084, as stated above, teaches that it is desirable to oxidize the sulfur dioxide to  $\text{SO}_3$  (note column 1, lines 62-65) before removing the  $\text{SO}_3$ .

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a process, as suggested by Izutsu '084, to first converting  $\text{SO}_2$  to  $\text{SO}_3$  and then removal the  $\text{SO}_3$  by contacting it with ammonia and water, as the desulfurization process in the process of Mimura '053 because such desulfurization process is known and conventional in the art.

Optionally, Slavid '164 can be applied to teach that sulfur dioxide is readily oxidized by ozone (note paragraph [0003]).

For difference (2), Gal '649 discloses a process for reduction of sulfur dioxide emission from combustion gases (note claim 1).

Gal '649 further discloses that combustion of fossil fuels produce exhaust gases, which contain sulfur dioxide, and other acidic gases (note column 1, lines 15-25). In the process of Gal '649, a reaction occurs during the scrubbing operation between the free ammonia and sulfur dioxide and if hydrogen chloride and/or hydrogen fluoride are present in the flue gas, as is the case with flue gas produced by the combustion of coal, these acidic gases are also captured to form ammonium chloride and ammonium fluoride (note column 4, lines 44-51).

Gal '649 can be further applied to teach the step of recovering ammonia after the desulfurization step (note Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the process of Mimura '053 to remove CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub> from a combustion gas containing HF and HCl in addition to the above mentioned oxides because Gal '649 teaches that these acid gas contaminants are conventional for a combustion gas generated when fossil fuel is combusted and these acid gas contaminants are simultaneously removed along with the SO<sub>x</sub> when the combustion gas is contacted with ammonia.

Applicant's arguments filed August 4, 2006 have been fully considered but they are not persuasive.

The rejection over Izutsu '084 in view of Hammer '022 and the admitted prior art on page 4 is withdrawn in view of Applicants' amendment to include the presence of CO<sub>2</sub> in the flue gas.

Applicants argue that Minura do not teach the simultaneous conversion of oxidized acid anhydride precursors and acid moieties.

Granted that Minura does not specifically disclose the simultaneous conversion of the acid anhydride precursors and acid moieties, however, since Gal '649, as applied above, teaches that for the combustion of fossil fuels, acid gases are present in the exhaust gas in addition to the sulfur dioxide; thus, in Minura, the step of converting acid anhydride precursors would inherently convert any acid gases contained in the exhaust gases.

Applicants argue that Minura do not suggest the use of aqua ammonia in the removal process.

Applicants' claims require the use of "aqua ammonia compounds", not just "aqua ammonia". The compounds used in Minura are considered as the claimed "aqua ammonia compounds" as required in Applicants' claims.

Applicants argue that even if the references were combined, they would not result in the Applicants' claimed invention.

As stated in the above rejection, Minura discloses a process which includes a cooling step which would also remove particulate at the same time (note Minura '053, column 2, lines 23-26), oxidizing the anhydride precursors (note step D in Figure), converting the oxidized acid anhydride precursors (note step E in Figure) and remove CO<sub>2</sub> (note step F in Figure). Gal '649 is applied to teach the conventional step of using ammonia for the desulfurization step (step E of Minura) and the presence of acid gases in the exhaust gases from burning fossil fuel and the acid gases would inherently be removed (note the reasons as stated above).

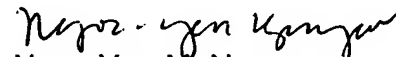
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on Part time schedule.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stanley Silverman can be reached on (571) 272-1358. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 or (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed (571) 272-1700.

  
Ngoc-Yen M. Nguyen  
Primary Examiner  
Art Unit 1754

nmn

October 16, 2006 .